

PAT-NO: JP407264279A

DOCUMENT-IDENTIFIER: JP 07264279 A

TITLE: ECHO CANCELLER

PUBN-DATE: October 13, 1995

INVENTOR-INFORMATION:

NAME

YOSHIDA, TOSHIO

SHISHIDO, DOUCHIYUU

ASSIGNEE-INFORMATION:

NAME

NEC CORP

COUNTRY

N/A

APPL-NO: JP06048128

APPL-DATE: March 18, 1994

INT-CL (IPC): H04M001/60, H04B003/23

ABSTRACT:

PURPOSE: To prevent the production of a bypass signal having a sense of incongruity by cancelling a hybrid or sound bypass signal independently of hand-free talking or handset talking.

CONSTITUTION: Digital adders 105a, 105b add a pseudo echo signal to a bypass signal to implement arithmetic processing to cancel the echo signal. Adaptive echo cancellers 112a, 112b generate a pseudo echo signal to be sent to the adders 105a, 105b respectively while optimizing them. A controller 113 confirms the result of echo cancelling operation by the adders 105a, 105b and gives an optimizing command to the adaptive echo cancellers 112a, 112b.

Furthermore, the controller 113 selects a receiver amplifier 110/a speaker amplifier 108 according to a hand-free control signal and adjusts the gain of a microphone amplifier 115.

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(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平7-264279

(43) 公開日 平成7年(1995)10月13日

(51) Int.Cl. ⁸	識別記号	庁内整理番号	F I	技術表示箇所
H 0 4 M 1/60		A		
H 0 4 B 3/23				

審査請求 未請求 請求項の数4 O L (全 7 頁)

(21) 出願番号 特願平6-48128

(22) 出願日 平成6年(1994)3月18日

(71) 出願人 000004237

日本電気株式会社
東京都港区芝五丁目7番1号

(72) 発明者 吉田 敏夫

東京都港区芝五丁目7番1号 日本電気株式会社内

(72) 発明者 矢戸 道宙

東京都港区芝五丁目7番1号 日本電気株式会社内

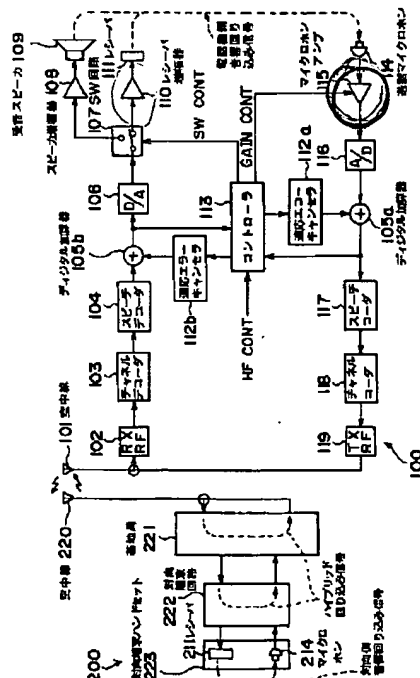
(74) 代理人 弁理士 後藤 洋介 (外2名)

(54) 【発明の名称】 エコーキャンセラ装置

(57) 【要約】

【目的】 ハンズフリー通話、ハンドセット通話に関係なくハイブリット及び音響回り込み信号をキャンセルし、違和感の有る回り込み信号が発生しない様にする。

【構成】 デジタル加算器105a, 105bは回り込み信号に擬似エコー信号を加算して、エコー信号を打ち消す演算処理を行う。適応エコーキャンセラ112a, 112bはそれぞれ加算器105a, 105bに送出する擬似エコー信号を最適化しながら発生する。コントローラ113は、加算器105a, 105bによるエコーキャンセリング演算結果を確認し、適応エコーキャンセラ112a, 112bに最適化指示を出す。また、コントローラ113は、ハンズフリー制御信号に従ってレシーバ増幅器110/スピーカ増幅器108を切り替え、またマイクロホンアンプ115の利得を調整する。



【特許請求の範囲】

【請求項1】 対向部から送信されてきた対向側無線送話音声電波を受信・復調して得られる受信音声信号をレシーバにより受信音声に再生すると共に、送話音声を送話マイクロホンによって送話音声信号に変換し、該送話音声信号によって搬送波を変調することによって得られる電話機側無線送話音声電波を前記対向部へ送信する移動電話機に用いられるエコーキャンセラ装置であって、該エコーキャンセラ装置は、前記受信音声信号が前記送話マイクロホンに回り込んだ電話機側音響回り込み信号を打ち消すためのものであり、

前記電話機側音響回り込み信号を含む前記送話音声信号に電話機側擬似エコー信号を加算して、前記電話機側音響回り込み信号を打ち消す演算処理を行う加算器と、前記受信音声信号に基づいて、前記加算器に送出する前記電話機側擬似エコー信号を最適化しながら発生する適応エコーキャンセラと、前記加算器によるエコーキャンセリング演算結果を確認し、前記適応エコーキャンセラに最適化指示を出すコントローラとを含むエコーキャンセラ装置。

【請求項2】 前記移動電話機は、受話スピーカと、該受話スピーカと前記レシーバとを切り替えるためのスイッチ回路と、前記送話マイクロホンから出力された送話音声信号を増幅するマイクロホンアンプとを備え、前記コントローラは、ハンズフリー制御信号にตอบสนองして、前記スイッチ回路に対して前記受信音声信号を前記レシーバ側から前記受話スピーカ側へ切り替えるように指示すると共に、ゲイン制御信号により前記マイクロホンアンプの利得を調整することを特徴とする、請求項1記載のエコーキャンセラ装置。

【請求項3】 対向部から送信されてきた対向側無線送話音声電波を受信・復調して得られる受信音声信号をレシーバにより受信音声に再生すると共に、送話音声を送話マイクロホンによって送話音声信号に変換し、該送話音声信号によって搬送波を変調することによって得られる電話機側無線送話音声電波を前記対向部へ送信する移動電話機に用いられるエコーキャンセラ装置であって、該エコーキャンセラ装置は、前記対向局において受信された前記電話機側無線送話音声電波が回り込んで得られる対向側回り込み信号を打ち消すためのエコーキャンセラ装置であって、

前記対向側回り込み信号を含む前記受信音声信号に対向側擬似エコー信号を加算して、前記対向側回り込み信号を打ち消す演算処理を行う加算器と、

前記送話音声信号に基づいて、前記加算器に送出する前記対向側擬似エコー信号を最適化しながら発生する適応エコーキャンセラと、

前記加算器によるエコーキャンセリング演算結果を確認し、前記適応エコーキャンセラに最適化指示を出すコントローラとを含むエコーキャンセラ装置。

【請求項4】 前記移動電話機は、受話スピーカと、該受話スピーカと前記レシーバとを切り替えるためのスイッチ回路と、前記送話マイクロホンから出力された送話音声信号を増幅するマイクロホンアンプとを備え、前記コントローラは、ハンズフリー制御信号にตอบสนองして、前記スイッチ回路に対して前記受信音声信号を前記レシーバ側から前記受話スピーカ側へ切り替えるように指示すると共に、ゲイン制御信号により前記マイクロホンアンプの利得を調整することを特徴とする、請求項3記載のエコーキャンセラ装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明はエコーキャンセラ装置に関し、特にディジタル方式移動電話機に使用されるエコーキャンセラ装置に関する。

【0002】

【従来の技術】従来から種々のエコーキャンセラ装置を備えた移動電話機が提案されている。ここでは、図2を参照して、特開平3-114344号公報（以下、先行技術1と呼ぶ）に開示されている「ハンズフリー携帯電話機」を例にとって説明する。

【0003】図示のハンズフリー携帯電話機100

は、送信音声電波を放射すると共に受信音声電波を無線受信音声信号として受信する空中線（アンテナ）101と、空中線101へ送出すべき無線送信音声信号と無線受信音声信号とを分波する送受分波器130と、送受分波器130によって分波された無線受信音声信号をベースバンド受信音声信号に変換する共にベースバンド送信音声信号を無線送信音声信号に変換する無線部131

と、電話機の制御を行う制御部132と、受信音声信号のレベルを変える可変抵抗器133と、可変抵抗器133から出力される受信音声信号を受信音声に変換する受話スピーカ109およびイヤホン134と、送話音声を送話音声信号に変換する送話マイクロホン114と、送話音声信号を受話スピーカ109側にリークする側音回路135と、ハンズフリー通話時とハンドセット通話時の切替えを行う為のハンズフリー通話／ハンドセット通話切替えスイッチ136と、送話音声信号を増幅する増幅器137と、ベースバンド受信音声信号に基づいて音響エコー経路の伝達特性を推定し、擬似エコー信号を出力するエコーキャンセラ138と、増幅器137の出力から擬似エコー信号を減算して、上記ベースバンド送信音声信号を出力する加算器139とを有する。

【0004】次に、図2に示したハンズフリー携帯電話機100の動作について説明する。ハンズフリー通話／ハンドセット通話切替えスイッチ136をハンドセット通話側にすると、送話音声信号の一部を側音信号として受話スピーカ109へ伝えるための側音回路135がオンとなり、エコーキャンセラ138はオフとなる。

【0005】一方、切替えスイッチ136をハンズフリ

一通話側にすると、側音回路135はオフとなり、エコーキャンセラ138はオンとなる。エコーキャンセラ138は対向端末(図示せず)からの受話音声信号を入力とし、最適化された擬似エコー信号を出力する。受話スピーカ109で再生された対向端末からの受話音声の一部は音響回り込み音として送話マイクロホン114へ回り込み、音響回り込み信号として増幅器137で増幅され、加算器139へ供給される。加算器139は音響回り込み信号から上記最適化された擬似エコー信号を差し引き、音響回り込み信号を打ち消す。加算器139の出力はエコーキャンセラ138へ帰還され、エコーキャンセラ138は音響回り込み信号が最小になる様に擬似エコー信号を最適化する。この処理を繰り返すことにより、音響エコーが対向端末へ伝送されるのを防いでいる。

【0006】本発明に関連する他の先行技術として、以下に述べるものが知られている。特開平3-129928号公報(以下、先行技術2と呼ぶ)には、擬似エコーを生成する適応デジタルフィルタとエコーの位相変化を推定し擬似エコーを変調する位相補償器と、無線機の復調出力から位相補償器の出力を差引く加算器とを設けることにより、近端エコーに周波数オフセットが加わっても、そのエコーを十分に打ち消すことができる「自動車電話モデム用エコーキャンセラ」が開示されている。

【0007】また、特開平3-16438号公報(以下、先行技術3と呼ぶ)には、エコーキャンセラ前後に受信信号に対し変数を乗算する手段を設け、閾値と比較しその結果により変数を更新することで、受信信号のレベルが過大である場合にのみ受信信号のレベルを下げられるようにした「ハンズフリー自動車電話機」が開示されている。

【0008】特開平2-298124号公報(以下、先行技術4と呼ぶ)には、自動車電話でハンズフリー通話を行う際使用するエコーキャンセラ回路において、通話終了時から通話開始時までの期間、通話終了時のADF(適応デジタルフィルタ)のタップ係数を保持させる機能を持たせることにより、通話開始時から良好な通話品質を得ることができる「エコーキャンセラ回路」が開示されている。

【0009】特開昭64-81557号公報(以下、先行技術5と呼ぶ)には、送話信号または受話信号の鳴音経路の特性に基づいて鳴音を相殺する逆位相の擬似信号を設定するデジタル信号処理手段を設けて、鳴音発生そのものを予防できる「自動車電話機」が開示されている。

【0010】

【発明が解決しようとする課題】先行技術1および4に記載されているように、従来のエコーキャンセラ装置は、ハンズフリー通話時のみに使用されており、ハンドセット通話時には使用されることがなかった。しかしな

がら、ハンドセット通話時でも音響回り込み信号が多量に発生しないということはない。また、回線側のハイブリッド回り込み信号の量や対向端末系の音響回り込み信号の量が増大すると、ハンズフリー通話時、ハンドセット通話時に関係なく、自分が発声した送話音声音が戻り違和感があった。

【0011】それ故に本発明の課題は、ハンドセット通話時にハイブリッド及び音響回り込み信号をキャンセルし、違和感の有る回り込み信号が発生しない様にできるエコーキャンセラ装置を提供することにある。

【0012】先行技術2は、近端エコーに周波数オフセットが加わっても、そのエコーを十分に打ち消す技術を開示するのみで、本発明とは解決しようとする課題が相違している。先行技術3は、受信信号のレベルが過大である場合にのみ受信信号のレベルを下げられるようにした技術を開示するのみで、本発明とは解決しようとする課題が相違している。また、先行技術5は鳴音発生そのものを予防する技術を開示しているだけで、本発明とは解決しようとする課題が相違している。

【0013】

【課題を解決するための手段】本発明の第1の態様によれば、対向部から送出されてきた対向側無線送話音声電波を受信・復調して得られる受信音声信号をレシーバにより受信音声に再生すると共に、送話音声を送話マイクロホンによって送話音声信号に変換し、この送話音声信号によって搬送波を変調することによって得られる電話機側無線送話音声電波を対向部へ送信する移動電話機に用いられるエコーキャンセラ装置であって、このエコーキャンセラ装置は、受信音声音が送話マイクロホンに回り込んだ電話機側音響回り込み信号を打ち消すためのものであり、電話機側音響回り込み信号を含む送話音声信号に電話機側擬似エコー信号を加算して、電話機側音響回り込み信号を打ち消す演算処理を行う加算器と、受信音声信号に基づいて、加算器に送出する電話機側擬似エコー信号を最適化しながら発生する適応エコーキャンセラと、加算器によるエコーキャンセリング演算結果を確認し、適応エコーキャンセラに最適化指示を出すコントローラとを含むエコーキャンセラ装置が得られる。

【0014】本発明の第2の態様によれば、対向部から送出されてきた対向側無線送話音声電波を受信・復調して得られる受信音声信号をレシーバにより受信音声に再生すると共に、送話音声を送話マイクロホンによって送話音声信号に変換し、この送話音声信号によって搬送波を変調することによって得られる電話機側無線送話音声電波を対向部へ送信する移動電話機に用いられるエコーキャンセラ装置であって、このエコーキャンセラ装置は、対向局において受信された電話機側無線送話音声電波が回り込んで得られる対向側回り込み信号を打ち消すためのものであり、対向側回り込み信号を含む受信音声信号に対向側擬似エコー信号を加算して、対向側回り

込み信号を打ち消す演算処理を行う加算器と、送話音声信号に基づいて、加算器に送出する対向側擬似エコー信号を最適化しながら発生する適応エコーキャンセラと、加算器によるエコーキャンセリング演算結果を確認し、適応エコーキャンセラに最適化指示を出すコントローラを含むエコーキャンセラ装置が得られる。

【0015】

【作用】本発明の第1の態様によるエコーキャンセラ装置では、ハンドセット通話時に電話機側音響回り込み信号を打ち消すことができる。また、本発明の第2の態様

【0016】

【実施例】次に、本発明について図面を参照して詳細に説明する。

【0017】図1を参照して、本発明の一実施例によるエコーキャンセラ装置を含むデジタル方式移動電話機100とこれに対向する対向部200とを有する移動通信システムについて説明する。

【0018】周知のように、移動通信においては、広い範囲にわたるサービスエリアをいくつかに分割し、おのおのに基地局を配置する方法が採用されている。分割された各エリアは、無線ゾーンと呼ばれる。各無線ゾーンには、複数の無線チャネルのなかから使用可能な1つの無線チャネルが割り当てられる。

【0019】デジタル方式移動電話機100は、電話機空中線101と、受信側無線部(RX RF)102と、チャネルデコーダ103と、スピーチデコーダ104と、第1および第2のデジタル加算器105aおよび105bと、デジタル/アナログ(D/A)変換器106と、スイッチ(SW)回路107と、スピーカ増幅器108と、受話スピーカ109と、レシーバ増幅器110と、レシーバ111と、第1および第2の適応エコーキャンセラ112aおよび112bと、コントローラ113と、送話マイクロホン114と、マイクロホンアンプ115と、アナログ/デジタル(A/D)変換器116と、スピーチコーダ117と、チャネルコーダ118と、送信側無線部(TX RF)119とを備える。

【0020】対向部200は、基地局空中線220と、基地局221と、対向端末回路222と、対向端末ハンドセット223とを備える。対向端末ハンドセット223はレシーバ211とマイクロホン214とを有する。

【0021】対向部200において、対向端末ハンドセット223を所持した対向側話者によって発声された対向側送話音声信号は、マイクロホン214によって対向側送話音声信号に変換され、対向端末回路222を介して基地局221に送出され、ここで対向側無線送話音声電波として基地局空中線220より発射される。

【0022】デジタル方式移動電話機100におい

て、上記対向側無線送話音声電波は電話機空中線101で電話機側無線受信音声電波として受信され、受信側無線部102で復調された後、チャネルデコーダ103で所定のチャネルの信号のみが取り出され、スピーチデコーダ104によって電話機側デジタル受信音声信号に復号化される。

【0023】第1および第2のデジタル加算器105aおよび105bと、第1および第2の適応エコーキャンセラ112aおよび112bと、コントローラ113とによって本発明に係るエコーキャンセラ装置が構成されるが、その動作については後で詳細に説明する。

【0024】電話機側デジタル受信音声信号は第2のデジタル加算器105bを介してD/A変換器106に供給される。D/A変換器106は電話機側デジタル受信音声信号を電話機側アナログ受信音声信号に変換する。電話機側アナログ受信音声信号はスイッチ回路107に供給される。後述するように、コントローラ113から供給されるスイッチ制御信号(SW CONT)にตอบสนองして、スイッチ回路107は受話スピーカ109側かレシーバ111側のどちらかを一方を選択する。スイッチ回路107がレシーバ111側を選択したとき、電話機側アナログ受信音声信号はレシーバ増幅器110を介してレシーバ111に供給され、レシーバ111によって対向側送話音声を再生した電話機側受信音声信号が得られる。スイッチ回路107が受話スピーカ109側を選択したとき、電話機側アナログ受信音声信号はスピーカ増幅器108を介して受話スピーカ109に供給され、受話スピーカ109によって対向側送話音声が再生される。

【0025】一方、デジタル方式移動電話機100において、それを所持した電話機側話者によって発声された電話機側送話音声信号は、送話マイクロホン114によって電話機側送話音声信号に変換され、マイクロホンアンプ115で増幅された後、A/D変換器116に供給される。A/D変換器116は電話機側送話音声信号を電話機側デジタル送話音声信号に変換する。この電話機側デジタル送話音声信号は第1のデジタル加算器105aを介してスピーチコーダ117に供給される。電話機側デジタル送話音声信号はスピーチコーダ117で符号化された後、チャネルコーダ118によって所定のチャネルの信号に変換され、送信側無線部119によって電話機側無線送話音声電波に変調され、電話機空中線101より発射される。

【0026】対向部200において、上記電話機側無線送話音声電波は基地局空中線220で対向側無線受信音声電波として受信され、基地局221によって復調された後、対向端末回路222を介して対向端末ハンドセット223に供給され、この中のレシーバ211によって電話機側送話音声を再生した相手側受信音声信号が得られる。

【0027】次に、本発明に係るエコーキャンセラ装置について説明する。

【0028】第1のデジタル加算器105aはA/D変換器116から出力される電話機側デジタル送話音声信号に後述する第1の適応エコーキャンセラ112aから発生される電話機側擬似エコー信号を加算して、電話機側デジタル送話音声信号からそれに含まれるエコー信号を打ち消す演算処理を行う。第1の適応エコーキャンセラ112aは第2のデジタル加算器105bから出力される電話機側デジタル受信音声信号に基づいて第1のデジタル加算器105aに送出する電話機側擬似エコー信号を最適化しながら発生する。

【0029】同様に、第2のデジタル加算器105bはスピーチデコーダ104から出力される電話機側デジタル受信音声信号に後述する第2の適応エコーキャンセラ112bから発生される対向側擬似エコー信号を加算して、電話機側デジタル受信音声信号からそれに含まれるエコー信号を打ち消す演算処理を行う。第2の適応エコーキャンセラ112bは第1のデジタル加算器105aから出力される電話機側デジタル送話音声信号に基づいて第2のデジタル加算器105bに送出する対向側擬似エコー信号を最適化しながら発生する。

【0030】コントローラ113は、第1および第2のデジタル加算器5aおよび5bによるエコーキャンセリング演算結果を確認し、第1および第2の適応エコーキャンセラ112aおよび112bに最適化指示を出す。また、コントローラ113は、外部から供給されるハンズフリー制御信号(HF CONT)に従って、スイッチ回路107へスイッチ制御信号(SW CONT)を送出することによりレシーバ増幅器110/スピーカ増幅器108の切り替えを行わせる。それに対応して、コントローラ113は、利得制御信号(GAIN CONT)によりマイクロホンアンプ115の利得を調整する様に指示を出す。

【0031】スイッチ回路107は上記スイッチ制御信号に基づいて受話経路をレシーバ増幅器110およびレシーバ111方向からスピーカ増幅器108および受話スピーカ109方向へ切り替える。

【0032】マイクロホンアンプ115は、上記利得制御信号に基づいて、ハンドセット通話時とハンドフリー通話時の2段階の利得設定が可能である。

【0033】次に、図1に示したエコーキャンセラ装置を含むデジタル方式移動電話機100の動作について説明する。最初にハンドセット通話時の動作について説明する。このとき、スイッチ回路107は図1に示すようにレシーバ増幅器110側を選択している。

【0034】上述したように、対向部200から送信されてきた電話機側デジタル受信音声信号はD/A変換器106の手前で2つに分配される。その一方はD/A変換器106で電話機側アナログ受信音声信号に変換さ

れ、レシーバ増幅器110で増幅され、レシーバ111で対向側送話音声が再生される。他方はコントローラ113から第1の適応エコーキャンセラ112aに加えられ、そこから電話機側擬似エコー信号として第1のデジタル加算器105aに加えられる。

【0035】レシーバ111で再生された電話機側受話音声は、その一部が電話機側音響回り込み信号として送話マイクロホン114に回り込み、マイクロホンアンプ115で増幅され、A/D変換器116で電話機側デジタル音響回り込み信号に変換され、第1のデジタル加算器105aに加えられる。この第1のデジタル加算器105aでは、第1の適応エコーキャンセラ112aから供給される、上述した最適化された電話機側擬似エコー信号を電話機側デジタル音響回り込み信号を含む電話機側デジタル送話音声信号に加算して、電話機側音響回り込み信号を打ち消す(エコーキャンセリング)処理を行う。

【0036】コントローラ113では、エコーキャンセリング演算結果を確認し、上述した電話機側音響回り込み信号がなくなる様に、第1の適応エコーキャンセラ112aに最適化指示を出す。

【0037】上述した処理を繰り返すことにより、違和感の有る電話機側音響回り込み信号が発生しないようにすることができる。

【0038】一方、送話マイクロホン114で集音された電話機側送話音声信号をA/D変換器116でデジタル変換して得られる電話機側デジタル送話音声信号は、スピーチコーダ117の手前で2つに分配させる。その一方は、スピーチコーダ117、チャンネルコーダ118、および送信側無線部119を通り、電話機空中線101から電話機側送信無線電波として送出される。この電話機側送信無線電波は基地局空中線220で対向側受信信号として受信された後、基地局221、対向端末回路222を通り、対向端末ハンドセット223内のレシーバ211で電話機側送話音声を再生した対向側受話音声が得られる。他方は、コントローラ113から第2の適応エコーキャンセラ112bに加えられ、この第2の適応エコーキャンセラ112bから最適化された対向側擬似エコー信号として第2のデジタル加算器105bに加えられる。

【0039】一方、対向端末ハンドセット223内のレシーバ211で再生された対向側受話音声の一部は、対向側音響回り込み信号となり、マイクロホン214から送出される。また、対向側受信信号の一部も、基地局221及び対向端末回路222内においてハイブリッド回り込み信号として発生する。対向側音響回り込み信号とハイブリッド回り込み信号とをひとまとめにして対向側回り込み信号と呼ぶ。対向側回り込み信号は、基地局空中線220、電話機空中線101、受信側無線部102、チャンネルデコーダ103、およびスピーチデコーダ

104を介して、第2のデジタル加算器105bに加えられる。

【0040】第2のデジタル加算器105bでは、この対向側回り込み信号を含む電話機側受話音声信号に、第2の適応エコーキャンセラ112bからの最適化された対向側擬似エコー信号を加算して、対向側回り込み信号を打ち消す(エコーキャンセリング)演算処理を行う。

【0041】コントローラ113では、この第2のデジタル加算器105bによるエコーキャンセリング演算結果を確認し、対向側回り込み信号がなくなる様に第2の適応エコーキャンセラ112bに最適化指示を出す。

【0042】上述した処理を繰り返し行うことにより、対向部200で発生した違和感のある対向側回り込み信号を打ち消すことができる。

【0043】次に、キー操作等によりハンズフリー通話状態に移行した場合の動作について説明する。この場合、ハンズフリー制御信号がコントローラ113に供給される。このハンズフリー制御信号にตอบสนองして、コントローラ113はスイッチ制御信号と利得制御信号をそれぞれスイッチ回路107およびマイクロホンアンプ115へ送出する。スイッチ制御信号にตอบสนองして、スイッチ回路107は、受話経路、すなわち、受話音声信号の流れをレシーバ111方向から受話スピーカ109方向へ切り替える。利得制御信号にตอบสนองして、マイクロホンアンプ115はその利得をハンズフリー通話時の設定に切り替える。これにより、ハンズフリー通話が可能となる。

【0044】このハンズフリー通話中においても、上述したハンドセット通話時の同様の処理を行うことにより、デジタル方式移動電話機100側において受話スピーカ109から送話マイクロホン114へ回り込んだ電話機側音響回り込み信号をキャンセルし、また、基地局221および対向端末回路222内で発生したハイブリッド回り込み信号と対向端末ハンドセット223内のレシーバ211からマイクロホン214へ回り込んだ対向側音響回り込み信号とからなる対向側回り込み信号をキャンセルすることができる。

【0045】尚、本発明は上述した実施例に限定されず、本発明の要旨を逸脱しない範囲内で種々の変形・変更が可能であるのは勿論である。

【0046】

【発明の効果】以上説明したように本発明は、ハンドセット通話中、対向部で発生された対向側送話音声の戻りを防止できると共に、自分自身が発声した電話機送話音声の戻りを防止できる。また、ハンズフリー通話時にもハンドセット通話時と同様の効果が得られる。

【図面の簡単な説明】

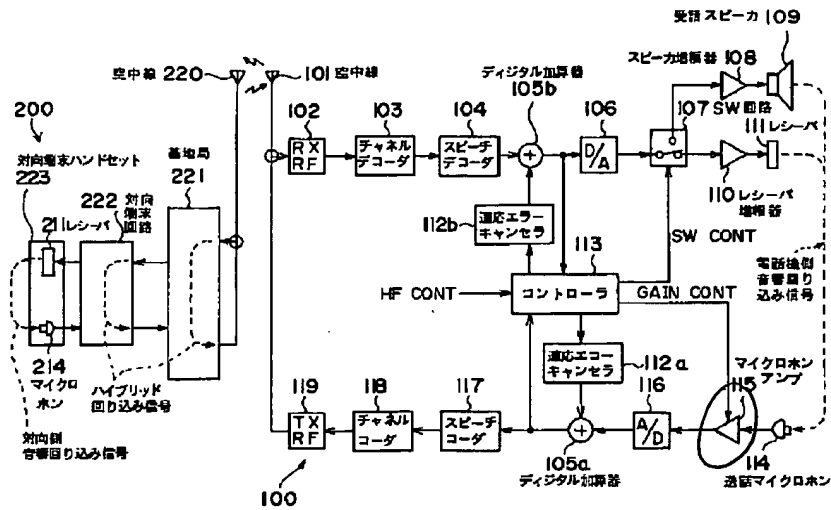
【図1】本発明の一実施例によるエコーキャンセラ装置を含むデジタル方式移動電話機とこれに対向する対向部とを有する移動通信システムを示すブロック図である。

【図2】特開平3-114344号公報に開示された、従来のハンズフリー携帯電話機の構成を示すブロック図である。

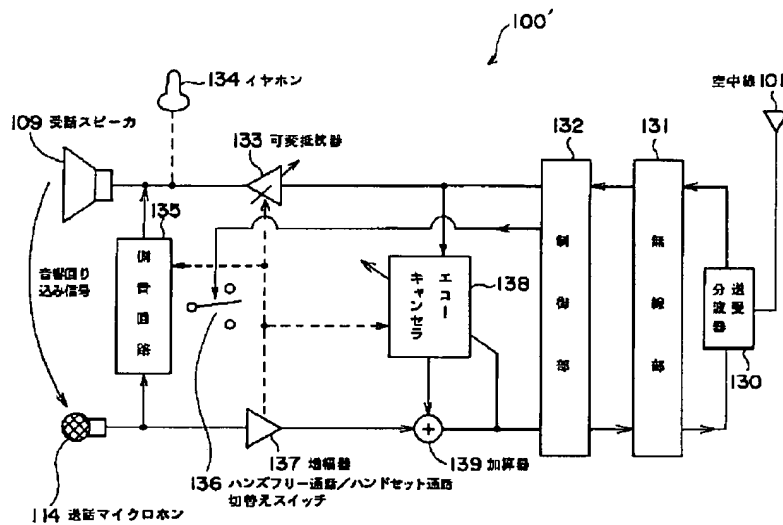
【符号の説明】

100 デジタル方式移動電話機
101 電話機空中線
102 受信側無線部(RX RF)
103 チャンネルデコーダ
104 スピーチデコーダ
105a, 105b デジタル加算器
106 デジタル/アナログ(D/A)変換器
107 スイッチ(SW)回路
108 スピーカ増幅器
109 受話スピーカ
110 レシーバ増幅器
111 レシーバ
112a, 112b 適応エコーキャンセラ
113 コントローラ
114 送話マイクロホン
115 マイクロホンアンプ
116 アナログ/デジタル(A/D)変換器
117 スピーチコーダ
118 チャンネルコーダ
119 送信側無線部(TX RF)
200 対向部
211 レシーバ
214 マイクロホン
220 基地局空中線
221 基地局
222 対向端末回路
223 対向端末ハンドセット

【図1】



【図2】



PATENT ABSTRACTS OF JAPAN

(1) PUBLICATION NUMBER OMIT

07_264279

(43) DATE OF PUBLICATION OF APPLICATION OMIT 13_M10_M1995

(51) INT. CL. (M)

H04M 1/60

H04B 3/23

(21) APPLICATION NUMBER OMIT 06_048128

(71) APPLICANT OMIT NEC CORP

(22) DATE OF FILING OMIT 18_M03_M1994

(72) INVENTOR OMIT YOSHIDA TOSHIO

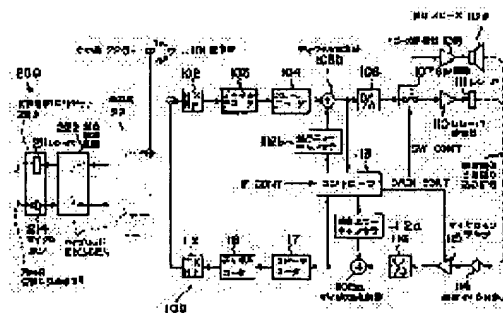
SHISHIDO DOUCHIYUU

(54) ECHO CANCELLER

(57) ABSTRACT OMIT

PURPOSE OMIT TO PREVENT THE PRODUCTION OF A BYPASS SIGNAL HAVING A SENSE OF INCONGRUITY BY CANCELLING A HYBRID OR SOUND BYPASS SIGNAL INDEPENDENTLY OF HAND-FREE TALKING OR HANDSET TALKING MI

CONSTITUTION OMIT DIGITAL ADDERS 105_A MA 105_b ADD A PSEUDO ECHO SIGNAL TO A BYPASS SIGNAL TO IMPLEMENT ARITHMETIC PROCESSING TO CANCEL THE ECHO SIGNAL MI ADAPTIVE ECHO CANCELLERS 112_A MA 112_b GENERATE A PSEUDO ECHO SIGNAL TO BE SENT TO THE ADDERS 105_A MA 105_b RESPECTIVELY WHILE OPTIMIZING THEM MI A CONTROLLER 113 CONFIRMS THE RESULT OF ECHO CANCELLING OPERATION BY THE ADDERS 105_A MA 105_b AND GIVES AN OPTIMIZING COMMAND TO THE ADAPTIVE ECHO CANCELLERS 112_A MA 112_b MI FURTHERMORE MA THE CONTROLLER 113 SELECTS A RECEIVER AMPLIFIER 110/A SPEAKER AMPLIFIER 108 ACCORDING TO A HAND-FREE CONTROL SIGNAL AND ADJUSTS THE GAIN OF A MICROPHONE AMPLIFIER 115 MI



LEGAL STATUS

(DATE OF REQUEST FOR EXAMINATION)

15_M11_M1995

(DATE OF SENDING THE EXAMINER'S DECISION OF REJECTION)

09_M09_M1998

(KIND OF FINAL DISPOSAL OF APPLICATION OTHER THAN THE
EXAMINER^{ADO}'S DECISION OF REJECTION OR APPLICATION CONVERTED
REGISTRATION)

(DATE OF FINAL DISPOSAL FOR APPLICATION)

(PATENT NUMBER)

(DATE OF REGISTRATION)

(NUMBER OF APPEAL AGAINST EXAMINER^{ADO}'S DECISION OF REJECTION)

(DATE OF REQUESTING APPEAL AGAINST EXAMINER^{ADO}'S DECISION OF
REJECTION)

(DATE OF EXTINCTION OF RIGHT)

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CLAIMS

[Claim(s)]

[Claim 1] The echo canceller equipment used for the migration telephone set transmit the telephone set side wireless transmission voice electric wave acquired by changing a transmission voice sound to a transmission sound signal by the transmission microphone, and becoming irregular about a subcarrier by this transmission sound signal while reproducing with a receiver the receiving sound signal acquired by receiving and restoring to a pair opposite-side wireless transmission voice electric wave which is characterized by to provide the following, and which has been transmitted from the opposite section in a receiving voice sound to said opposite section This echo canceller equipment is an adder which performs data processing which adds a telephone set side false echo signal to said transmission sound signal which is for negating a circumference lump signal of telephone set side sound with which said receiving voice sound turned to said transmission microphone, and includes said circumference lump signal of telephone set side sound, and negates said circumference lump signal of telephone set side sound. An adaptation echo canceller generated while optimizing said telephone set side false echo signal sent out to said adder based on said receiving sound signal A controller which checks the echo can selling result of an operation by said adder, and takes out optimization directions to said adaptation echo canceller

[Claim 2] It is echo canceller equipment according to claim 1 which is equipped with the following, said controller answers a handsfree control signal, and is characterized by adjusting gain of said microphone amplifier with a gain control signal while directing to change said receiving sound signal from said receiver side to said receiver loudspeaker side to said switching circuit. Said migration telephone set is a receiver loudspeaker. A switching circuit for changing this receiver loudspeaker and said receiver Microphone amplifier which amplifies a transmission sound signal outputted from said transmission microphone

[Claim 3] The echo canceller equipment used for the migration telephone set transmit the telephone set side wireless transmission voice electric wave acquired by changing a transmission voice sound to a transmission sound signal by the transmission microphone, and becoming irregular about a subcarrier by this transmission sound signal while reproducing with a receiver the receiving sound signal acquired by receiving and restoring to a pair opposite-side wireless transmission voice electric wave which is characterized by to provide the following, and which has been transmitted from the opposite section in a receiving voice sound to said opposite section This echo canceller equipment is an adder which performs data processing which adds a pair opposite side false echo signal to said receiving sound signal which is echo canceller equipment for negating a circumference lump signal of the pair opposite side with which said telephone set side wireless transmission voice electric wave received in said opposite station turns, and is acquired, and includes said circumference lump signal of the pair opposite side, and negates said circumference lump signal of the pair opposite side. An adaptation echo canceller generated while optimizing said pair opposite side false echo signal sent out to said adder based on said transmission sound signal A controller which checks the echo can selling result of an operation by said adder, and takes out optimization directions to said adaptation echo canceller

[Claim 4] It is echo canceller equipment according to claim 3 which is equipped with the following, said controller answers a handsfree control signal, and is characterized by adjusting gain of said microphone amplifier with a gain control signal while directing to change said receiving sound signal from said receiver side to said receiver loudspeaker side to said switching circuit. Said migration telephone set is a receiver loudspeaker. A switching circuit for changing this receiver loudspeaker and said receiver Microphone amplifier which amplifies a transmission sound signal outputted from said transmission microphone

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the echo canceller equipment used for a digital method migration telephone set about echo canceller equipment.

[0002]

[Description of the Prior Art] The migration telephone set equipped with various echo canceller equipments from the former is proposed. Here, with reference to drawing 2, it explains taking the case of the "handsfree portable telephone" currently indicated by JP,3-114344,A (it is hereafter called the advanced technology 1).

[0003] The aerial 101 which receives a receiving voice electric wave as a wireless receiving sound signal while handsfree portable telephone 100' of illustration emits a transmitting voice electric wave (antenna), The transmission-and-reception splitter 130 which separates spectrally the wireless transmitting sound signal which should be sent out to aerial 101, and a wireless receiving sound signal, The wireless section 131 which changes into a baseband receiving sound signal the wireless receiving sound signal separated spectrally with the transmission-and-reception splitter 130 and which changes both baseband transmitting sound signals into a wireless transmitting sound signal, The control section 132 which controls a telephone set, and the variable resistor 133 into which the level of a receiving sound signal is changed, The receiver loudspeaker 109 and earphone 134 which change into a receiving voice sound the receiving sound signal outputted from a variable resistor 133, The transmission microphone 114 which changes a transmission voice sound into a transmission sound signal, and the sidetone circuit 135 which leaks a transmission sound signal to the receiver loudspeaker 109 side, The handsfree message / hand-set message changeover switch 136 for performing the change at the time of a handsfree message and a hand-set message, The amplifier 137 which amplifies a transmission sound signal, and the echo canceller 138 which presumes the transfer characteristics of a sound echo path based on a baseband receiving sound signal, and outputs a false echo signal, A false echo signal is subtracted from the output of amplifier 137, and it has the adder 139 which outputs the above-mentioned baseband transmitting sound signal.

[0004] Next, the actuation of handsfree portable telephone 100' shown in drawing 2 is explained. If a handsfree message / hand-set message changeover switch 136 is made into a hand-set message side, the sidetone circuit 135 for telling to the receiver loudspeaker 109 by making a part of transmission sound signal into a sidetone signal will serve as ON, and an echo canceller 138 will become off.

[0005] On the other hand, if a changeover switch 136 is made into a handsfree message side, a sidetone circuit 135 will become off and an echo canceller 138 will serve as ON. An echo canceller 138 considers the receiver voice signal from an opposite terminal (not shown) as an input, and outputs the optimized false echo signal. A part of receiver voice sound from the opposite terminal reproduced by the receiver loudspeaker 109 is amplified with amplifier 137 as a surroundings lump and a circumference lump signal of sound as a circumference lump sound of sound to the transmission microphone 114, and it is supplied to an adder 139. An adder 139 deducts the false echo signal by which optimization was carried out [above-mentioned] from the circumference lump signal of sound, and negates the circumference lump signal of sound. The output of an adder 139 returns to an echo canceller 138, and an echo canceller 138 optimizes a false echo signal so that the circumference lump signal of sound may become min. By repeating this processing, it has prevented transmitting a sound echo to an opposite terminal.

[0006] What is described below is known as other advanced technology relevant to this invention. Even if a frequency offset joins a near end echo by forming the phase compensator which presumes the phase change of the adaptive digital filter which generates a false echo, and an echo, and modulates a false echo, and the adder which deducts the output of a phase compensator from the recovery output of a walkie-talkie in JP,3-129928,A (it being hereafter called the advanced technology 2), the "echo canceller for automobile telephone modems" which can fully negate the echo is indicated.

[0007] Moreover, the means which carries out the multiplication of the variable to an input signal is

established before and after an echo canceller, and by updating a variable by the result as compared with a threshold, only when the level of an input signal is excessive, the "handsfree automobile telephone set" which enabled it to lower the level of an input signal is indicated by JP,3-16438,A (it is hereafter called the advanced technology 3).

[0008] In the echo canceller circuit used for it in case a land mobile radiotelephone performs a handsfree message in JP,2-298124,A (it is hereafter called the advanced technology 4), the "echo canceller circuit" which can obtain a good speech quality from the time of message initiation is indicated by giving the function to make the period of the time of message termination to the time of message initiation, and the tap coefficient of ADF at the time of message termination (adaptive digital filter) hold.

[0009] A digital-signal-processing means to set the false signal of the opposite phase which offsets singing based on the property of the singing path of a transmission signal or a receiver signal to JP,64-81557,A (for it to be hereafter called the advanced technology 5) is established, and the "automobile telephone set" which can prevent the singing generating itself is indicated.

[0010]

[Problem(s) to be Solved by the Invention] Conventional echo canceller equipment is used only at the time of a handsfree message, and was not used at the time of a hand-set message as indicated by advanced technology 1 and 4. However, the circumference lump signal of sound may occur also in the time of a hand-set message. Moreover, when the amount of the circumference lump signal of a hybrid by the side of a circuit and the amount of the circumference lump signal of sound of an opposite terminal system increased, return sense of incongruity had the transmission voice sound which he uttered not related at the time of a hand-set message at the time of a handsfree message.

[0011] So, the technical problem of this invention cancels a hybrid and the circumference lump signal of sound at the time of a hand-set message, and is to offer the echo canceller equipment a surroundings lump signal with sense of incongruity can be prevented from generating.

[0012] It is only that the advanced technology 2 indicates the technology of fully negating the echo even if a frequency offset joins a near end echo, and the technical problem which it is going to solve is different from this invention. case the advanced technology 3 has the excessive level of an input signal -- the level of an input signal -- lowering ** -- it is only indicating the technology made like and the technical problem which it is going to solve is different from this invention. Moreover, the advanced technology 5 is only indicating the technology which prevents the singing generating itself, and the technical problem which it is going to solve is different from this invention.

[0013]

[Means for Solving the Problem] While reproducing with a receiver a receiving sound signal acquired by receiving and restoring to a pair opposite side wireless transmission voice electric wave sent out from the opposite section in a receiving voice sound according to the 1st mode of this invention It is echo canceller equipment used for a migration telephone set which transmits a telephone set side wireless transmission voice electric wave acquired by changing a transmission voice sound into a transmission sound signal with a transmission microphone, and modulating a subcarrier with this transmission sound signal to the opposite section. This echo canceller equipment A telephone set side false echo signal is added to a transmission sound signal which is for negating a circumference lump signal of telephone set side sound with which a receiving voice sound turned to a transmission microphone, and includes a circumference lump signal of telephone set side sound. An adder which performs data processing which negates a circumference lump signal of telephone set side sound, and an adaptation echo canceller generated while optimizing a telephone set side false echo signal sent out to an adder based on a receiving sound signal, The echo can selling result of an operation by adder is checked, and echo canceller equipment containing a controller which takes out optimization directions to an adaptation echo canceller is obtained.

[0014] While reproducing with a receiver a receiving sound signal acquired by receiving and restoring to a pair opposite side wireless transmission voice electric wave sent out from the opposite section in a receiving voice sound according to the 2nd mode of this invention It is echo canceller equipment used for a migration telephone set which transmits a telephone set side wireless transmission voice electric

wave acquired by changing a transmission voice sound into a transmission sound signal with a transmission microphone, and modulating a subcarrier with this transmission sound signal to the opposite section. This echo canceller equipment A pair opposite side false echo signal is added to a receiving sound signal which is for negating a circumference lump signal of the pair opposite side with which a telephone set side wireless transmission voice electric wave received in an opposite station turns, and is acquired, and includes a circumference lump signal of the pair opposite side. An adder which performs data processing which negates a circumference lump signal of the pair opposite side, and an adaptation echo canceller generated while optimizing a pair opposite side false echo signal sent out to an adder based on a transmission sound signal, The echo can selling result of an operation by adder is checked, and echo canceller equipment containing a controller which takes out optimization directions to an adaptation echo canceller is obtained.

[0015]

[Function] With the echo canceller equipment by the 1st mode of this invention, the circumference lump signal of telephone set side sound can be negated at the time of a hand-set message. Moreover, with the echo canceller equipment by the 2nd mode of this invention, the circumference lump signal of the pair opposite side can be negated at the time of a hand-set message.

[0016]

[Example] Next, this invention is explained to details with reference to a drawing.

[0017] With reference to drawing 1, the migration communication system which has the digital method migration telephone set 100 containing the echo canceller equipment by one example of this invention and the opposite section 200 which counters this is explained.

[0018] As everyone knows, in mobile communication, the service area covering a large range is divided into some, and the method of arranging a base station to each is adopted. Each divided area is called a wireless zone. One usable radio channel is assigned to each wireless zone out of two or more radio channels.

[0019] The digital method migration telephone set 100 The telephone set aerial 101 and the receiving-side wireless section 102 (RX RF), The channel decoder 103, the speech decoder 104, and the 1st and the 2nd digital adder 105a and 105b, Digital one / analog (D/A) converter 106, and the switch (SW) circuit 107, The loudspeaker amplifier 108, the receiver loudspeaker 109, and the receiver amplifier 110, A receiver 111, and the 1st and the 2nd adaptation echo canceller 112a and 112b, It has a controller 113, the transmission microphone 114, the microphone amplifier 115, the analog / digital (A/D) converter 116, the speech coder 117, the channel coder 118, and the transmitting-side wireless section (TX RF) 119.

[0020] The opposite section 200 is equipped with the base station aerial 220, a base station 221, the opposite terminal circuit 222, and the opposite terminal hand set 223. The opposite terminal hand set 223 has a receiver 211 and a microphone 214.

[0021] In the opposite section 200, with a microphone 214, the pair opposite side transmission voice sound uttered by the pair opposite side speaker who possessed the opposite terminal hand set 223 is changed into a pair opposite side transmission sound signal, is sent out to a base station 221 through the opposite terminal circuit 222, and is discharged from the base station aerial 220 as a pair opposite side wireless transmission voice electric wave here.

[0022] In the digital method migration telephone set 100, only the signal of a channel predetermined by the channel decoder 103 is taken out, and the above-mentioned pair opposite side wireless transmission voice electric wave is decrypted by the telephone set side digital receiving sound signal by the speech decoder 104, after being received as a telephone set side wireless receiving voice electric wave in the telephone set aerial 101 and getting over in the receiving-side wireless section 102.

[0023] Although the echo canceller equipment applied to this invention by the 1st and 2nd digital adders 105a and 105b, the 1st and 2nd adaptation echo cancellers 112a and 112b, and the controller 113 is constituted, the actuation is explained to details later.

[0024] A telephone set side digital receiving sound signal is supplied to D/A converter 106 through 2nd digital adder 105b. D/A converter 106 changes a telephone set side digital receiving sound signal into a

telephone set side analog receiving sound signal. A telephone set side analog receiving sound signal is supplied to a switching circuit 107. The switch control signal (SW CONT) supplied from a controller 113 is answered, and a switching circuit 107 chooses one side for one of the receiver loudspeaker 109 side and the receiver 111 sides so that it may mention later. When a switching circuit 107 chooses a receiver 111 side, a telephone set side analog receiving sound signal is supplied to a receiver 111 through the receiver amplifier 110, and the telephone set side receiving voice sound which reproduced the pair opposite side transmission voice sound with the receiver 111 is obtained. When a switching circuit 107 chooses the receiver loudspeaker 109 side, a telephone set side analog receiving sound signal is supplied to the receiver loudspeaker 109 through the loudspeaker amplifier 108, and a pair opposite side transmission voice sound is reproduced by the receiver loudspeaker 109.

[0025] After the telephone set side transmission voice sound uttered in the digital method migration telephone set 100 on the other hand by the telephone set side speaker who possessed it is changed into a telephone set side transmission sound signal by the transmission microphone 114 and is amplified with the microphone amplifier 115 with it, it is supplied to A/D converter 116. A/D converter 116 changes a telephone set side transmission sound signal into a telephone set side digital transmission sound signal. This telephone set side digital transmission sound signal is supplied to the speech coder 117 through 1st digital adder 105a. After encoding in the speech coder 117, a telephone set side digital transmission sound signal is changed into the signal of a predetermined channel by the channel coder 118, and a telephone set side wireless transmission voice electric wave becomes irregular, and it is discharged by the transmitting-side wireless section 119 from the telephone set aerial 101.

[0026] In the opposite section 200, after receiving the above-mentioned telephone set side wireless transmission voice electric wave as a pair opposite side wireless receiving voice electric wave in the base station aerial 220 and getting over by the base station 221, the opposite terminal hand set 223 is supplied through the opposite terminal circuit 222, and the other party receiving voice sound which reproduced the telephone set side transmission voice sound with the receiver 211 in this is obtained.

[0027] Next, the echo canceller equipment concerning this invention is explained.

[0028] 1st digital adder 105a adds the telephone set side false echo signal generated from 1st adaptation echo canceller 112a later mentioned to the telephone set side digital transmission sound signal outputted from A/D converter 116, and performs data processing which negates the echo signal included in it from a telephone set side digital transmission sound signal. 1st adaptation echo canceller 112a is generated optimizing the telephone set side false echo signal sent out to 1st digital adder 105a based on the telephone set side digital receiving sound signal outputted from 2nd digital adder 105b.

[0029] Similarly, 2nd digital adder 105b adds the pair opposite side false echo signal generated from 2nd adaptation echo canceller 112b later mentioned to the telephone set side digital receiving sound signal outputted from the speech decoder 104, and performs data processing which negates the echo signal included in it from a telephone set side digital receiving sound signal. 2nd adaptation echo canceller 112b is generated optimizing the pair opposite side false echo signal sent out to 2nd digital adder 105b based on the telephone set side digital transmission sound signal outputted from 1st digital adder 105a.

[0030] A controller 113 checks the echo can selling result of an operation by the 1st and 2nd digital adders 5a and 5b, and takes out optimization directions to the 1st and 2nd adaptation echo cancellers 112a and 112b. Moreover, a controller 113 makes the 110/loudspeaker amplifier 108 of receiver amplifier change by sending out a switch control signal (SW CONT) to a switching circuit 107 according to the handsfree control signal (HF CONT) supplied from the outside. Corresponding to it, a controller 113 issues directions so that a gain control signal (GAIN CONT) may adjust the gain of the microphone amplifier 115.

[0031] A switching circuit 107 changes a receiver path in the loudspeaker amplifier 108 and the receiver loudspeaker 109 direction from receiver amplifier 110 and receiver 111 direction based on the above-mentioned switch control signal.

[0032] Based on the above-mentioned gain control signal, two steps of gain settings, at the time of a hand-set message and a hand free message, are possible for the microphone amplifier 115.



[0033] Next, actuation of the digital method migration telephone set 100 containing the echo canceller equipment shown in drawing 1 is explained. The actuation at the time of a hand-set message is first. At this time, the switching circuit 107 has chosen the receiver amplifier 110 side, as shown in drawing 1.

[0034] As mentioned above, the telephone set side digital receiving sound signal transmitted from the opposite section 200 is distributed to two before D/A converter 106. One of these is changed into a telephone set side analog receiving sound signal with D/A converter 106, it is amplified with the receiver amplifier 110, and a pair opposite side transmission voice sound is reproduced with a receiver 111. Another side is added to 1st adaptation echo canceller 112a from a controller 113, and is added to 1st digital adder 105a as a telephone set side false echo signal from there.

[0035] The part is amplified by the transmission microphone 114 with a surroundings lump and the microphone amplifier 115 as a circumference lump signal of telephone set side sound, and the telephone set side bearer talk voice sound reproduced with the receiver 111 is changed into the circumference lump signal of telephone set side digital sound with A/D converter 116, and is applied to 1st digital adder 105a. In this 1st digital adder 105a, the optimized telephone set side false echo signal which is supplied from 1st adaptation echo canceller 112a and which was mentioned above is added to a telephone set side digital transmission sound signal including the circumference lump signal of telephone set side digital sound, and processing which negates the circumference lump signal of telephone set side sound (echo can selling) is performed.

[0036] The echo can selling result of an operation is checked, and optimization directions are taken out with a controller 113 to 1st adaptation echo canceller 112a so that the circumference lump signal of telephone set side sound mentioned above may be lost.

[0037] The circumference lump signal of telephone set side sound with sense of incongruity can be prevented from generating by repeating the processing mentioned above.

[0038] On the other hand, the telephone set side digital transmission sound signal acquired by carrying out digital conversion with A/D converter 116 makes the telephone set side transmission sound signal collected with the transmission microphone 114 distribute to two before the speech coder 117. One of these passes along the speech coder 117, the channel coder 118, and the transmitting-side wireless section 119, and is sent out as a telephone set side transmitting wireless electric wave from the telephone set aerial 101. This telephone set side transmitting wireless electric wave passes along a base station 221 and the opposite terminal circuit 222, after being received as a pair opposite side input signal in the base station aerial 220, and the pair opposite side receiver voice sound which reproduced telephone set side transmission voice with the receiver 211 in the opposite terminal hand set 223 is obtained. Another side is added to 2nd adaptation echo canceller 112b from a controller 113, and is added to 2nd DITARU adder 105b as a pair opposite side false echo signal optimized from this 2nd adaptation echo canceller 112b.

[0039] On the other hand, a part of pair opposite side receiver voice sound reproduced with the receiver 211 in the opposite terminal hand set 223 serves as a circumference lump signal of pair opposite side sound, and it is sent out from a microphone 214. Moreover, a part of pair opposite side input signal is generated as a circumference lump signal of a hybrid in a base station 221 and the opposite terminal circuit 222. The circumference lump signal of pair opposite side sound and the circumference lump signal of a hybrid are put together, and it is called the circumference lump signal of the pair opposite side. The circumference lump signal of the pair opposite side is added to 2nd digital adder 105b through the base station aerial 220, the telephone set aerial 101, the receiving-side wireless section 102, the channel decoder 103, and the speech decoder 104.

[0040] In 2nd digital adder 105b, the pair opposite side false echo signal optimized from 2nd adaptation echo canceller 112b is added to a telephone set side bearer talk sound signal including this circumference lump signal of the pair opposite side, and data processing which negates the circumference lump signal of the pair opposite side (echo can selling) is performed.

[0041] The echo can selling result of an operation by this 2nd digital adder 105b is checked, and optimization directions are taken out with a controller 113 to 2nd adaptation echo canceller 112b so that

the circumference lump signal of the pair opposite side may be lost.

[0042] By repeating the processing mentioned above and performing it, the circumference lump signal of the pair opposite side with the sense of incongruity generated in the opposite section 200 can be negated.

[0043] Next, the actuation at the time of shifting to a handsfree talk state by a key stroke etc. is explained. In this case, a handsfree control signal is supplied to a controller 113. Answering this handsfree control signal, a controller 113 sends out a switch control signal and a gain control signal to a switching circuit 107 and the microphone amplifier 115, respectively. A switch control signal is answered and a switching circuit 107 changes the flow of a receiver path, i.e., a receiver voice signal, in the receiver loudspeaker 109 direction from receiver 111 direction. Answering a gain control signal, the microphone amplifier 115 changes the gain to a setup at the time of a handsfree message. Thereby, a handsfree message is attained.

[0044] By performing same processing at the time of the hand-set message mentioned above during this handsfree message The circumference lump signal of telephone set side sound around which it turned to the digital method migration telephone set 100 side from the receiver loudspeaker 109 to the transmission microphone 114 is canceled. Moreover, the circumference lump signal of the pair opposite side which consists of a circumference lump signal of a hybrid generated in the base station 221 and the opposite terminal circuit 222 and a circumference lump signal of pair opposite side sound around which it turned from the receiver 211 in the opposite terminal hand set 223 to the microphone 214 is cancellable.

[0045] In addition, of course, deformation and modification various by within the limits which this invention is not limited to the example mentioned above, and does not deviate from the summary of this invention are possible.

[0046]

[Effect of the Invention] As explained above, this invention can prevent the return of the telephone set transmission voice sound which he uttered during a hand-set message while being able to prevent the return of the pair opposite side transmission voice sound generated in the opposite section. Moreover, the effect same also at the time of a handsfree message as the time of a hand-set message is acquired.

PRIOR ART

[Description of the Prior Art] The migration telephone set equipped with various echo canceller equipments from the former is proposed. Here, with reference to drawing 2, it explains taking the case of the "handsfree portable telephone" currently indicated by JP,3-114344,A (it is hereafter called the advanced technology 1).

[0003] The aerial 101 which receives a receiving voice electric wave as a wireless receiving sound signal while handsfree portable telephone 100' of illustration emits a transmitting voice electric wave (antenna), The transmission-and-reception splitter 130 which separates spectrally the wireless transmitting sound signal which should be sent out to aerial 101, and a wireless receiving sound signal, The wireless section 131 which changes into a baseband receiving sound signal the wireless receiving sound signal separated spectrally with the transmission-and-reception splitter 130 and which changes both baseband transmitting sound signals into a wireless transmitting sound signal, The control section 132 which controls a telephone set, and the variable resistor 133 into which the level of a receiving sound signal is changed, The receiver loudspeaker 109 and earphone 134 which change into a receiving voice sound the receiving sound signal outputted from a variable resistor 133, The transmission microphone 114 which changes a transmission voice sound into a transmission sound signal, and the sidetone circuit 135 which leaks a transmission sound signal to the receiver loudspeaker 109 side, The handsfree message / hand-set message changeover switch 136 for performing the change at the time of a handsfree message and a hand-set message, The amplifier 137 which amplifies a transmission sound signal, and the echo canceller 138 which presumes the transfer characteristics of a sound echo path based on a baseband receiving sound signal, and outputs a false echo signal, A false echo signal is subtracted from the output of amplifier 137, and it has the adder 139 which outputs the above-mentioned baseband transmitting sound signal.

[0004] Next, the actuation of handsfree portable telephone 100' shown in drawing 2 is explained. If a handsfree message / hand-set message changeover switch 136 is made into a hand-set message side, the sidetone circuit 135 for telling to the receiver loudspeaker 109 by making a part of transmission sound signal into a sidetone signal will serve as ON, and an echo canceller 138 will become off.

[0005] On the other hand, if a changeover switch 136 is made into a handsfree message side, a sidetone circuit 135 will become off and an echo canceller 138 will serve as ON. An echo canceller 138 considers the receiver voice signal from an opposite terminal (not shown) as an input, and outputs the optimized false echo signal. A part of receiver voice sound from the opposite terminal reproduced by the receiver loudspeaker 109 is amplified with amplifier 137 as a surroundings lump and a circumference lump signal of sound as a circumference lump sound of sound to the transmission microphone 114, and it is supplied to an adder 139. An adder 139 deducts the false echo signal by which optimization was carried out [above-mentioned] from the circumference lump signal of sound, and negates the circumference lump signal of sound. The output of an adder 139 returns to an echo canceller 138, and an echo canceller 138 optimizes a false echo signal so that the circumference lump signal of sound may become min. By repeating this processing, it has prevented transmitting a sound echo to an opposite terminal.

[0006] What is described below is known as other advanced technology relevant to this invention. Even if a frequency offset joins a near end echo by forming the phase compensator which presumes the phase change of the adaptive digital filter which generates a false echo, and an echo, and modulates a false echo, and the adder which deducts the output of a phase compensator from the recovery output of a walkie-talkie in JP,3-129928,A (it being hereafter called the advanced technology 2), the "echo canceller for automobile telephone modems" which can fully negate the echo is indicated.

[0007] Moreover, the means which carries out the multiplication of the variable to an input signal is established before and after an echo canceller, and by updating a variable by the result as compared with a threshold, only when the level of an input signal is excessive, the "handsfree automobile telephone set" which enabled it to lower the level of an input signal is indicated by JP,3-16438,A (it is hereafter called the advanced technology 3).

[0008] In the echo canceller circuit used for it in case a land mobile radiotelephone performs a handsfree

message in JP,2-298124,A (it is hereafter called the advanced technology 4), the "echo canceller circuit" which can obtain a good speech quality from the time of message initiation is indicated by giving the function to make the period of the time of message termination to the time of message initiation, and the tap coefficient of ADF at the time of message termination (adaptive digital filter) hold.

[0009] A digital-signal-processing means to set the false signal of the opposite phase which offsets singing based on the property of the singing path of a transmission signal or a receiver signal to JP,64-81557,A (for it to be hereafter called the advanced technology 5) is established, and the "automobile telephone set" which can prevent the singing generating itself is indicated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Conventional echo canceller equipment is used only at the time of a handsfree message, and was not used at the time of a hand-set message as indicated by advanced technology 1 and 4. However, the circumference lump signal of sound may occur also in the time of a hand-set message. Moreover, when the amount of the circumference lump signal of a hybrid by the side of a circuit and the amount of the circumference lump signal of sound of an opposite terminal system increased, return sense of incongruity had the transmission voice sound which he uttered not related at the time of a hand-set message at the time of a handsfree message.

[0011] So, the technical problem of this invention cancels a hybrid and the circumference lump signal of sound at the time of a hand-set message, and is to offer the echo canceller equipment a surroundings lump signal with sense of incongruity can be prevented from generating.

[0012] It is only that the advanced technology 2 indicates the technology of fully negating the echo even if a frequency offset joins a near end echo, and the technical problem which it is going to solve is different from this invention. case the advanced technology 3 has the excessive level of an input signal -- the level of an input signal -- lowering ** -- it is only indicating the technology made like and the technical problem which it is going to solve is different from this invention. Moreover, the advanced technology 5 is only indicating the technology which prevents the singing generating itself, and the technical problem which it is going to solve is different from this invention.

MEANS

[Means for Solving the Problem] While reproducing with a receiver a receiving sound signal acquired by receiving and restoring to a pair opposite side wireless transmission voice electric wave sent out from the opposite section in a receiving voice sound according to the 1st mode of this invention It is echo canceller equipment used for a migration telephone set which transmits a telephone set side wireless transmission voice electric wave acquired by changing a transmission voice sound into a transmission sound signal with a transmission microphone, and modulating a subcarrier with this transmission sound signal to the opposite section. This echo canceller equipment A telephone set side false echo signal is added to a transmission sound signal which is for negating a circumference lump signal of telephone set side sound with which a receiving voice sound turned to a transmission microphone, and includes a circumference lump signal of telephone set side sound. An adder which performs data processing which negates a circumference lump signal of telephone set side sound, and an adaptation echo canceller generated while optimizing a telephone set side false echo signal sent out to an adder based on a receiving sound signal, The echo can selling result of an operation by adder is checked, and echo canceller equipment containing a controller which takes out optimization directions to an adaptation echo canceller is obtained.

[0014] While reproducing with a receiver a receiving sound signal acquired by receiving and restoring to a pair opposite side wireless transmission voice electric wave sent out from the opposite section in a receiving voice sound according to the 2nd mode of this invention It is echo canceller equipment used for a migration telephone set which transmits a telephone set side wireless transmission voice electric wave acquired by changing a transmission voice sound into a transmission sound signal with a transmission microphone, and modulating a subcarrier with this transmission sound signal to the opposite section. This echo canceller equipment A pair opposite side false echo signal is added to a receiving sound signal which is for negating a circumference lump signal of the pair opposite side with which a telephone set side wireless transmission voice electric wave received in an opposite station turns, and is acquired, and includes a circumference lump signal of the pair opposite side. An adder which performs data processing which negates a circumference lump signal of the pair opposite side, and an adaptation echo canceller generated while optimizing a pair opposite side false echo signal sent out to an adder based on a transmission sound signal, The echo can selling result of an operation by adder is checked, and echo canceller equipment containing a controller which takes out optimization directions to an adaptation echo canceller is obtained.

EXAMPLE

[Example] Next, this invention is explained to details with reference to a drawing.

[0017] With reference to drawing 1, the migration communication system which has the digital method migration telephone set 100 containing the echo canceller equipment by one example of this invention and the opposite section 200 which counters this is explained.

[0018] As everyone knows, in mobile communication, the service area covering a large range is divided into some, and the method of arranging a base station to each is adopted. Each divided area is called a wireless zone. One usable radio channel is assigned to each wireless zone out of two or more radio channels.

[0019] The digital method migration telephone set 100 The telephone set aerial 101 and the receiving-side wireless section 102 (RX RF), The channel decoder 103, the speech decoder 104, and the 1st and the 2nd digital adder 105a and 105b, Digital one / analog (D/A) converter 106, and the switch (SW) circuit 107, The loudspeaker amplifier 108, the receiver loudspeaker 109, and the receiver amplifier 110, A receiver 111, and the 1st and the 2nd adaptation echo canceller 112a and 112b, It has a controller 113, the transmission microphone 114, the microphone amplifier 115, the analog / digital (A/D) converter 116, the speech coder 117, the channel coder 118, and the transmitting-side wireless section (TX RF) 119.

[0020] The opposite section 200 is equipped with the base station aerial 220, a base station 221, the opposite terminal circuit 222, and the opposite terminal hand set 223. The opposite terminal hand set 223 has a receiver 211 and a microphone 214.

[0021] In the opposite section 200, with a microphone 214, the pair opposite side transmission voice sound uttered by the pair opposite side speaker who possessed the opposite terminal hand set 223 is changed into a pair opposite side transmission sound signal, is sent out to a base station 221 through the opposite terminal circuit 222, and is discharged from the base station aerial 220 as a pair opposite side wireless transmission voice electric wave here.

[0022] In the digital method migration telephone set 100, only the signal of a channel predetermined by the channel decoder 103 is taken out, and the above-mentioned pair opposite side wireless transmission voice electric wave is decrypted by the telephone set side digital receiving sound signal by the speech decoder 104, after being received as a telephone set side wireless receiving voice electric wave in the telephone set aerial 101 and getting over in the receiving-side wireless section 102.

[0023] Although the echo canceller equipment applied to this invention by the 1st and 2nd digital adders 105a and 105b, the 1st and 2nd adaptation echo cancellers 112a and 112b, and the controller 113 is constituted, the actuation is explained to details later.

[0024] A telephone set side digital receiving sound signal is supplied to D/A converter 106 through 2nd digital adder 105b. D/A converter 106 changes a telephone set side digital receiving sound signal into a telephone set side analog receiving sound signal. A telephone set side analog receiving sound signal is supplied to a switching circuit 107. The switch control signal (SW CONT) supplied from a controller 113 is answered, and a switching circuit 107 chooses one side for one of the receiver loudspeaker 109 side and the receiver 111 sides so that it may mention later. When a switching circuit 107 chooses a receiver 111 side, a telephone set side analog receiving sound signal is supplied to a receiver 111 through the receiver amplifier 110, and the telephone set side receiving voice sound which reproduced the pair opposite side transmission voice sound with the receiver 111 is obtained. When a switching circuit 107 chooses the receiver loudspeaker 109 side, a telephone set side analog receiving sound signal is supplied to the receiver loudspeaker 109 through the loudspeaker amplifier 108, and a pair opposite side transmission voice sound is reproduced by the receiver loudspeaker 109.

[0025] After the telephone set side transmission voice sound uttered in the digital method migration telephone set 100 on the other hand by the telephone set side speaker who possessed it is changed into a telephone set side transmission sound signal by the transmission microphone 114 and is amplified with the microphone amplifier 115 with it, it is supplied to A/D converter 116. A/D converter 116 changes a

telephone set side transmission sound signal into a telephone set side digital transmission sound signal. This telephone set side digital transmission sound signal is supplied to the speech coder 117 through 1st digital adder 105a. After encoding in the speech coder 117, a telephone set side digital transmission sound signal is changed into the signal of a predetermined channel by the channel coder 118, and a telephone set side wireless transmission voice electric wave becomes irregular, and it is discharged by the transmitting-side wireless section 119 from the telephone set aerial 101.

[0026] In the opposite section 200, after receiving the above-mentioned telephone set side wireless transmission voice electric wave as a pair opposite side wireless receiving voice electric wave in the base station aerial 220 and getting over by the base station 221, the opposite terminal hand set 223 is supplied through the opposite terminal circuit 222, and the other party receiving voice sound which reproduced the telephone set side transmission voice sound with the receiver 211 in this is obtained.

[0027] Next, the echo canceller equipment concerning this invention is explained.

[0028] 1st digital adder 105a adds the telephone set side false echo signal generated from 1st adaptation echo canceller 112a later mentioned to the telephone set side digital transmission sound signal outputted from A/D converter 116, and performs data processing which negates the echo signal included in it from a telephone set side digital transmission sound signal. 1st adaptation echo canceller 112a is generated optimizing the telephone set side false echo signal sent out to 1st digital adder 105a based on the telephone set side digital receiving sound signal outputted from 2nd digital adder 105b.

[0029] Similarly, 2nd digital adder 105b adds the pair opposite side false echo signal generated from 2nd adaptation echo canceller 112b later mentioned to the telephone set side digital receiving sound signal outputted from the speech decoder 104, and performs data processing which negates the echo signal included in it from a telephone set side digital receiving sound signal. 2nd adaptation echo canceller 112b is generated optimizing the pair opposite side false echo signal sent out to 2nd digital adder 105b based on the telephone set side digital transmission sound signal outputted from 1st digital adder 105a.

[0030] A controller 113 checks the echo cancelling result of an operation by the 1st and 2nd digital adders 5a and 5b, and takes out optimization directions to the 1st and 2nd adaptation echo cancellers 112a and 112b. Moreover, a controller 113 makes the 110/loudspeaker amplifier 108 of receiver amplifier change by sending out a switch control signal (SW CONT) to a switching circuit 107 according to the handsfree control signal (HF CONT) supplied from the outside. Corresponding to it, a controller 113 issues directions so that a gain control signal (GAIN CONT) may adjust the gain of the microphone amplifier 115.

[0031] A switching circuit 107 changes a receiver path in the loudspeaker amplifier 108 and the receiver loudspeaker 109 direction from receiver amplifier 110 and receiver 111 direction based on the above-mentioned switch control signal.

[0032] Based on the above-mentioned gain control signal, two steps of gain settings, at the time of a hand-set message and a hand free message, are possible for the microphone amplifier 115.

[0033] Next, actuation of the digital method migration telephone set 100 containing the echo canceller equipment shown in drawing 1 is explained. The actuation at the time of a hand-set message is first. At this time, the switching circuit 107 has chosen the receiver amplifier 110 side, as shown in drawing 1.

[0034] As mentioned above, the telephone set side digital receiving sound signal transmitted from the opposite section 200 is distributed to two before D/A converter 106. One of these is changed into a telephone set side analog receiving sound signal with D/A converter 106, it is amplified with the receiver amplifier 110, and a pair opposite side transmission voice sound is reproduced with a receiver 111. Another side is added to 1st adaptation echo canceller 112a from a controller 113, and is added to 1st digital adder 105a as a telephone set side false echo signal from there.

[0035] The part is amplified by the transmission microphone 114 with a surroundings lump and the microphone amplifier 115 as a circumference lump signal of telephone set side sound, and the telephone set side bearer talk voice sound reproduced with the receiver 111 is changed into the circumference lump signal of telephone set side digital sound with A/D converter 116, and is applied to 1st digital

adder 105a. In this 1st digital adder 105a, the optimized telephone set side false echo signal which is supplied from 1st adaptation echo canceller 112a and which was mentioned above is added to a telephone set side digital transmission sound signal including the circumference lump signal of telephone set side digital sound, and processing which negates the circumference lump signal of telephone set side sound (echo can selling) is performed.

[0036] The echo can selling result of an operation is checked, and optimization directions are taken out with a controller 113 to 1st adaptation echo canceller 112a so that the circumference lump signal of telephone set side sound mentioned above may be lost.

[0037] The circumference lump signal of telephone set side sound with sense of incongruity can be prevented from generating by repeating the processing mentioned above.

[0038] On the other hand, the telephone set side digital transmission sound signal acquired by carrying out digital conversion with A/D converter 116 makes the telephone set side transmission sound signal collected with the transmission microphone 114 distribute to two before the speech coder 117. One of these passes along the speech coder 117, the channel coder 118, and the transmitting-side wireless section 119, and is sent out as a telephone set side transmitting wireless electric wave from the telephone set aerial 101. This telephone set side transmitting wireless electric wave passes along a base station 221 and the opposite terminal circuit 222, after being received as a pair opposite side input signal in the base station aerial 220, and the pair opposite side receiver voice sound which reproduced telephone set side transmission voice with the receiver 211 in the opposite terminal hand set 223 is obtained. Another side is added to 2nd adaptation echo canceller 112b from a controller 113, and is added to 2nd DITARU adder 105b as a pair opposite side false echo signal optimized from this 2nd adaptation echo canceller 112b.

[0039] On the other hand, a part of pair opposite side receiver voice sound reproduced with the receiver 211 in the opposite terminal hand set 223 serves as a circumference lump signal of pair opposite side sound, and it is sent out from a microphone 214. Moreover, a part of pair opposite side input signal is generated as a circumference lump signal of a hybrid in a base station 221 and the opposite terminal circuit 222. The circumference lump signal of pair opposite side sound and the circumference lump signal of a hybrid are put together, and it is called the circumference lump signal of the pair opposite side. The circumference lump signal of the pair opposite side is added to 2nd digital adder 105b through the base station aerial 220, the telephone set aerial 101, the receiving-side wireless section 102, the channel decoder 103, and the speech decoder 104.

[0040] In 2nd digital adder 105b, the pair opposite side false echo signal optimized from 2nd adaptation echo canceller 112b is added to a telephone set side bearer talk sound signal including this circumference lump signal of the pair opposite side, and data processing which negates the circumference lump signal of the pair opposite side (echo can selling) is performed.

[0041] The echo can selling result of an operation by this 2nd digital adder 105b is checked, and optimization directions are taken out with a controller 113 to 2nd adaptation echo canceller 112b so that the circumference lump signal of the pair opposite side may be lost.

[0042] By repeating the processing mentioned above and performing it, the circumference lump signal of the pair opposite side with the sense of incongruity generated in the opposite section 200 can be negated.

[0043] Next, the actuation at the time of shifting to a handsfree talk state by a key stroke etc. is explained. In this case, a handsfree control signal is supplied to a controller 113. Answering this handsfree control signal, a controller 113 sends out a switch control signal and a gain control signal to a switching circuit 107 and the microphone amplifier 115, respectively. A switch control signal is answered and a switching circuit 107 changes the flow of a receiver path, i.e., a receiver voice signal, in the receiver loudspeaker 109 direction from receiver 111 direction. Answering a gain control signal, the microphone amplifier 115 changes the gain to a setup at the time of a handsfree message. Thereby, a handsfree message is attained.

[0044] By performing same processing at the time of the hand-set message mentioned above during this handsfree message The circumference lump signal of telephone set side sound around which it turned to

the digital method migration telephone set 100 side from the receiver loudspeaker 109 to the transmission microphone 114 is canceled. Moreover, the circumference lump signal of the pair opposite side which consists of a circumference lump signal of a hybrid generated in the base station 221 and the opposite terminal circuit 222 and a circumference lump signal of pair opposite side sound around which it turned from the receiver 211 in the opposite terminal hand set 223 to the microphone 214 is cancellable.

[0045] In addition, of course, deformation and modification various by within the limits which this invention is not limited to the example mentioned above, and does not deviate from the summary of this invention are possible.

[0046]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the migration communication system which has a digital method migration telephone set containing the echo canceller equipment by one example of this invention, and the opposite section which counters this.

[Drawing 2] It is the block diagram which was indicated by JP,3-114344,A and in which showing the configuration of the conventional handsfree portable telephone.

[Description of Notations]

100 Digital Method Migration Telephone Set
101 Telephone Set Aerial
102 Receiving-Side Wireless Section (RX RF)
103 Channel Decoder
104 Speech Decoder
105a, 105b Digital adder
106 Digital One / Analog (D/A) Converter
107 Switch (SW) Circuit
108 Loudspeaker Amplifier
109 Receiver Loudspeaker
110 Receiver Amplifier
111 Receiver
112a, 112b Adaptation echo canceller
113 Controller
114 Transmission Microphone
115 Microphone Amplifier
116 Analog / Digital (A/D) Converter
117 Speech Coder
118 Channel Coder
119 Transmitting-Side Wireless Section (TX RF)
200 Opposite Section
211 Receiver
214 Microphone
220 Base Station Aerial
221 Base Station
222 Opposite Terminal Circuit
223 Opposite Terminal Hand Set